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APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE: GEOGRAPHIC AREA TEMPLATES
FOR COMPUTER GAMES

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1 GEOGRAPHIC AREA TEMPLATES
2 FOR COMPUTER GAMES
3
4 REFERENCE TO RELATED APPLICATIONS
5   The present application is related to copending patent applications entitled
6 "METHOD AND SYSTEM FOR USING GEOGRAHIC DATA IN COMPUTER
7 GAME DEVELOPMENT", Attorney Docket No. N0184US, "APPLICATION
8 PROGRAMMING INTERFACE FOR GEOGRAPHIC DATA IN COMPUTER
9 GAMES", Attorney Docket No. N0185US, and "COMPUTER GAME
10 DEVELOPMENT FACTORY SYSTEM AND METHOD", Attorney Docket No.
11 N0190US, the entire disclosures of which are incorporated by reference herein.
12
13 BACKGROUND OF THE INVENTION
14   The present invention relates to a system and method that facilitate development
15 of computer games and more particularly, a system and method that facilitate
16 development of computer games that include representations or depictions of simulated
17 real world geographic areas.
18   Computer games have developed in sophistication and commercial importance.
19 Improvements in computer hardware and software have enabled computer games to
20 provide realistic graphics and sound. With these advances, computer game users have
21 come to expect that games meet high standards for richness and attention to detail. For
22 computer games that are intended to represent real world places, such as road race games,
23 users expect the games to provide convincing depictions of the real world, with attention
24 to accuracy and detail.
25   Computer game developers have recognized the need to provide realistic
26 depictions of places in computer games. This has placed a burden on computer game

1   developers to obtain the data needed to portray geographic places with realistic detail and

2   accuracy. The collection of such detailed geographic data about real world roads, places,

3   etc., is time-consuming and expensive. Further, the collection of detailed real world data

4   diverts the resources of computer game developers away from other important aspects of

5   computer game creation, such as characters, story lines, and strategies. Thus, there exists

6   a need to facilitate the collection and use of geographic data by game developers.

7   Another consideration related to the development of computer games is that the

8   computer game developer may not want to depict an actual geographic location. Instead,

9   the computer game developer may want to depict a location that appears similar to an

10   actual location. For example, instead of depicting the actual city of Los Angeles, the

11   computer game developer may want to depict a southern California city that is like Los

12   Angeles. The computer game developer may want to do this for a variety of reasons.

13   One reason is that it relieves the computer game developer of the burden of collecting the

14   large amount of data needed to depict the actual city. Another consideration is that it

15   allows the computer game developer to avoid having game players find discrepancies

16   between the geographic location depicted in the computer game and the actual

17   geographic locations. Still another consideration is that it allows a computer game

18   developer to include advertising and product placements.

19   Even if a computer game developer decides to depict a location that is similar to

20   an actual location instead of the real location, the computer game developer is still faced

21   with the problem of obtaining enough geographic data from which to create the location

22   that is similar to an actual location. Thus, modeling a city similar to Los Angeles

23   requires a significant amount of effort in order to make the simulation realistic.

24   Accordingly, it is an objective to create representations of places that are like real

25   places.

26   It is another objective to facilitate development of a computer games that

27   represent or depict realistic appearing places that are similar to real places.

28

1 SUMMARY OF THE INVENTION

2   To address these and other objectives, the present invention includes a system and

3 method for facilitating development of computer games that depict or represent actual,

4 real world geographic areas as part of the play scenarios of the games. A source database

5 contains data that represent geographic features in a region including roads in the region.

6 The data in the source database includes attributes suitable for use for providing

7 navigation-related functions. In addition to providing data from the source database for

8 navigation-related functions, data from the source database are also used to form a

9 template database, wherein the template database represents an imaginary locale. The

10 template database is provided for computer game development.

11

12 BRIEF DESCRIPTION OF THE DRAWINGS

13   Figure 1 is a diagram that illustrates a relationship between a master version of a

14 geographic database and a coverage area.

15   Figure 2 is a block diagram showing a first embodiment of a system for

16 facilitating development of computer games using a template derived from the

17 geographic database of Figure 1.

18   Figure 3 is a flowchart of steps in a process performed by the template compiler

19 of Figure 2.

20   Figure 4 is a block diagram showing components of a system used by a computer

21 game developer that uses the geographic template produced by the process of Figure 3.

22   Figure 5 is a block diagram showing a second embodiment of a system for

23 facilitating development of computer games using a template derived from the

24 geographic database of Figure 1.

25   Figure 6 is a flowchart of steps in a process performed by the template compiler

26 of Figure 5.

27   Figure 7 is a block diagram showing components of a system used by a computer

28 game developer that uses the geographic template produced by the process of Figure 6.

29   Figure 8 is a block diagram showing another embodiment of a system for

30 facilitating development of computer games using a template.

1 DETAILED DESCRIPTION OF THE
2 PRESENTLY PREFERRED EMBODIMENTS

3 I.   SOURCE GEOGRAPHIC DATABASE.

4   Figure 1 shows a master or source version of a geographic database 100. The

5 master version of the geographic database is owned and developed by a geographic

6 database developer 101 (also referred to as a "map developer", a "map data developer" or

7 the like). (Although only one source database and geographic database developer are

8 shown, the embodiments disclosed herein are not limited to only a single source database

9 or a single geographic database developer.)

10   The master version of the geographic database 100 contains data 102 (also

11 referred to a "geographic data" or "spatial data") that represent geographic features in a

12 coverage area 104. The coverage area 104 may correspond to an entire country, such as

13 the United States. Alternatively, the coverage area 104 may correspond to several

14 countries, such as the United States, Canada, and Mexico, or France, Germany, and Italy,

15 and so on. According to another alternative, the coverage area 104 of the master version

16 of the geographic database 100 may represent only a single region within a country, such

17 as the West Coast or the Midwest of the U.S. Although the master version of the

18 geographic database 100 includes data that represent geographic features in the entire

19 coverage area 104, there may be parts of the coverage area 104 that contain geographic

20 features that are not represented by data in the geographic database, or for which the

21 representation of geographic features is sparse.

22   The master version of the geographic database 100 includes data about a road

23 network 120 located in the coverage area 104. The data about the road network 120

24 include various kinds of information, such as the geographic coordinates of positions of

25 the roads, street names of the roads, addresses ranges along the roads, turn restrictions at

26 intersections of roads, and so on. The master version of the geographic database 100 also

27 includes data about points of interest in the covered area 104. Points of interest may

28 include hotels, restaurants, museums, stadiums, offices, automobile dealerships, auto

29 repair shops, etc. The master version of the geographic database 100 may include data

30 about the locations of these points of interests. The master version of the geographic

1   database 100 may also include data about places, such as cities, towns, or other

2   communities, and other geographic features, such as bodies of water, mountain ranges,

3   etc. The master version of the geographic database 100 may include other kinds of

4   information.

5   There are different ways used by the geographic database developer to collect

6   data. These ways include obtaining data from other sources, such as municipalities. In

7   addition, the geographic database developer may employ field personnel to travel by

8   vehicle along roads throughout the geographic region to observe features and record

9   information about them. The data collected by the geographic database developer are

10 stored in the master version of the geographic database 100.

11 The geographic database developer 101 continues to collect data that represent the

12 features in the geographic coverage area 104 on an ongoing basis. One reason that the

13 geographic database developer continues to collect data is that the features in the

14 coverage area 104 change over time. Accordingly, the geographic database developer

15 collects data about the same features in order to update or confirm the previously

16 collected data about the features. Another reason that the geographic database developer

17 continues to collect data is to expand the coverage and/or detail of the master version of

18 the geographic database 100. For example, at one point in time the master version of the

19 geographic database 100 may include data that represents only a portion of the entire

20 coverage area 104. After that point in time, the geographic database developer collects

21 data about features in areas that were not previously represented in order to expand the

22 coverage of the master version of the geographic database 100.

23 The master version of the geographic database 100 is maintained as the copy that

24 has the most up-to-date data relating to the coverage area 104. Accordingly, the master

25 version of the geographic database 100 is updated, expanded, and/or otherwise modified

26 on a regular and continuing basis. To facilitate these operations, the master version of the

27 geographic database 100 is stored in a format that facilitates updating, maintenance, and

28 development. For example, the data in the master version 100 may be uncompressed.

29 Examples of suitable formats include the VSAM format and the GDF format, although

1   other kinds of formats, both proprietary and non-proprietary, may be suitable. In general,

2   the format of the master database 100 is not suitable for use in navigation systems.

3   A copy of the master version of the geographic database 100 is physically located

4   at a first location 114. In one embodiment, the master version of the geographic database

5   100 is stored on one or more hard drives, tapes or other media, and accessed with an

6   appropriate computer 116. Any suitable computer may be used, such as a mainframe

7   computer, a plurality of networked microcomputers, etc.

8

9   II.   FIRST EMBODIMENT

10   Figure 2 shows an overview of a first embodiment of a system and method for

11   facilitating the development of computer games using a template that includes

12   representations of geographic features that are similar to actual geographic features. In

13   Figure 2, the master version of the geographic database 100 is used to make compiled

14   database products 110. The compiled database products 110 are made using a compiler

15   111. The compiler 111 is a software program run on an appropriate computer platform.

16   The compiled database products 110 may include only portions of all the data in

17   the master version of the geographic database 100. For example, the compiled database

18   products 110 may include data that relate to only one or more specific sub-areas within

19   the coverage area 104 of the master version of the geographic database 100. Further, the

20   compiled database products 110 may include fewer than all the data attributes that

21   describe geographic features represented in the master version of the geographic database

22   100.

23   The compiled database products 110 are used on various kinds of computing

24   platforms. For example, the compiled database products 110 are used in computing

25   platforms 112 used for navigation. The computing platforms 112 used for navigation

26   include in-vehicle navigation systems, hand-held portable navigation systems, personal

27   computers (including desktop and notebook computers), and other kinds of devices, such

28   as personal digital assistant (PDA) devices, pagers, telephones, etc. The compiled

29   database products 110 are also used on networked computing platforms and

30   environments, including systems connected to the Internet.

1   The compiled database products 110 that are used in computing platforms used

2   for navigation are stored on suitable media. For example, the compiled database products

3   may be stored on CD-ROM disks, hard drives, DVD disks, flash memory, or other types

4   of media that are available now or that become available in the future.

5   On the computing platforms 112 used for navigation, the compiled database

6   products 110 are used by various software applications. For example, the compiled

7   database products 110 may be used by software applications that provide navigation-

8   related functions, such as route calculation, route guidance, vehicle positioning, map

9   display, and electronic yellow pages, as well as other kinds of functions.

10   As stated above, a computer game developer may not want to depict an actual

11   geographic locale, but instead may want to depict a geographic locale which is similar to

12   an actual locale. Therefore, in addition to producing compiled database products 110 for

13   use on computing platforms used for navigation, the geographic database developer 101

14   produces one or more geographic template products 200 for use by a computer game

15   developer 130. In a present embodiment, the geographic template products 200 are

16   produced by the geographic database developer 101 using a template compiler program

17   204, which is described in more detail below. The geographic template products 200

18   used by the computer game developer 130 may be similar to compiled database products

19   110 used in the computing platforms 112 used for navigation, except that the geographic

20   template products 200 do not represent actual real world places. The geographic template

21   products 200 may be provided on a suitable media, such as one or more CD-ROM disks,

22   DVD disks, or hard drives. Alternatively, the geographic template products 200 may be

23   provided over a network connection.

24   Figure 3 shows steps in a process 208 performed by the template compiler

25   program 204 for making a geographic template product 200 for use in a computer game

26   that depicts or represents an imaginary geographic locale as part of the play scenario of

27   the game. In this embodiment, the process 202 is performed by the geographic database

28   developer 101.

29   The imaginary geographic locale represented by the geographic template product

30   may be locale that is similar to one or more actual locales. For example, the imaginary

1 locale may be a southern California city. The imaginary geographic locale may also be a

2 fantasy locale. The imaginary geographic locale may also be an actual locale but set at a

3 different historical period (past or future) than the present.

4   In a first step of the process 208, one or more geographic locales are selected

5 (Step 212). In this step, the locales may include metropolitan areas, such as a southern

6 California metropolitan areas like the Los Angeles metropolitan area or the San Diego

7 metropolitan area. Alternatively, the locales may include metropolitan areas, such as

8 Midwestern metropolitan areas like the Chicago metropolitan area and the Detroit

9 metropolitan area. These locales may be selected manually, e.g., by a human operator

10 selecting the areas. Alternatively, the locales may be selected automatically using a

11 computer program that automatically uses the data in the master geographic database 100

12 to select locales within a selected region that have similar geographic characteristics like

13 road density. For example, if an operator selects a region, e.g., southern California, a

14 program automatically identifies major urban areas in the region.

15   Once the geographic locales have been selected, data that represent the locales are

16 obtained from the geographic database 100 (Step 214). In one embodiment, all the data

17 in the master geographic database 100 that represent the selected locales are obtained.

18 Alternatively, only some of the data in the master geographic database 100 that represent

19 the selected locales are obtained. For example, only selected attributes that represent the

20 locales may be obtained.

21   After the data that represents the selected locales has been obtained, certain

22 parameters of the geographic locales are determined (Step 220). These parameters

23 characterize the locales. These parameters are obtained by comparison of the

24 corresponding data from the different locales. (If only a single locale is selected in Step

25 212, the parameters are determined from data that represents only the single locale.)

26   Examples of the types of parameters that are determined include the following:

27   Overall size. For example, one parameter that is determined indicates the average

28 overall size of the locales. This parameter may be determined by calculating the average

29 of the overall areas of the locales for which data have been obtained.

1   Road density (by type). Another parameter is a road density distribution. Some
2   geographic locales have large (in area) sections with densely-spaced streets.

3   Road shape. Another parameter is a road shape. Some geographic locales tend to
4   have road with lots of curves, whereas other locales tend to roads that are relatively
5   straight.

6   Road widths. Another parameter indicates the different types of road widths and
7   the percentage of each type.

8   Expressway density. Some geographic locales have a relatively large number of
9   expressways.

10   Road orientation. Some locales tend to have roads all aligned in a north-south,
11   east-west grid pattern.

12   Road alignment. Some locales tend to have a lot of roads that do not meet at right
13   angles.

14   Altitude variety. Some locales tend to have many altitude changes, e.g., lots of
15   hills.

16   Geographic features. These parameters indicate the types, sizes, shapes, number
17   of geographic features, such as lakes, rivers, mountains, etc.

18   Open spaces. This parameter indicates the type, number, size, density, etc., of
19   open spaces in a locale. These may include parks, golf courses, etc.

20   POIs. This parameter indicates the types, density, number, etc. of the points of
21   interest in the locales. These points of interest include businesses, government buildings,
22   monuments, stadiums, airports, etc.

23   Buildings. This parameter indicates the types, sizes, shapes, etc., of the buildings
24   located in a locale.

25   Signage. This parameter indicates the types of signs, the text on different signs,
26   sign shape, sign layout, the density and placement of signs, etc.

27   There may be other parameters that are determined in addition to these. A
28   parameter can be determined for any type of data contained in the geographic database
29   100.

1   Once the parameters have been determined for the locales in the selected region, a

2   template 222 is formed (Step 224). The template has a structure similar to a geographic

3   database that represents an actual region. However, the template does not represent an

4   actual locale. Instead, the template is based on the parameters so that its characteristics

5   are similar to those of all the locales in the selected region. For example, if the selected

6   region is southern California, and the selected locales include Los Angeles and San

7   Diego, a parameter for expressway density would indicate relatively many expressways

8   per square mile. A template formed for this region would have an expressway density

9   that corresponds to this parameter.

10   One way to form the template database is to start with one of the actual databases

11   and transform the data. For example, starting with a database that represents Los

12   Angeles, each data entity representing a road segment (or groups of data entities

13   representing groups of road segments) would be modified to alter the location of the

14   represented road segment. Some techniques that may be employed to form the template

15   database from the actual database include moving the locations of roads by varying

16   distances, switching the relative vertical ordering of roads that cross each other at

17   different elevations, forming mirror images of roads located in an area, performing

18   horizontal or rotational transformations of the location of groups of roads, and so on.

19   Quality assurance testing would be used to insure that the modification maintained

20   database integrity, including connectivity of the modified road network.

21   A similar process would be used for data that represented other kinds of

22   represented features, such as points of interest, geographic features, such as lakes, rivers,

23   etc., buildings, and so on.

24   Once this information has been prepared and stored in the template geographic

25   database, names are determined for the represented geographic features (Step 228). In

26   determining street names, a thesaurus function may be used to obtain similar names that

27   correspond to real world names. For example, if streets in the real world database are

28   named "Oak" and "Pine", the template database may include corresponding streets

29   named "Elm" and "Poplar."

1   After the name information is added to the template 222, other compilation steps

2   may be performed on the template 222. These other compilation steps may be similar to

3   the steps performed on the geographic database products 110 used for navigation

4   purposes.

5   The template 222 is provided to the game developer 130. The template 222 is

6   used by the computer game developer 130 in a similar manner as an actual geographic

7   database would be used. The computer game developer 130 uses the template 222 data,

8   along with other data and components, to create one or more computer games 132.

9   In creating computer games 132, the computer game developer 130 may include

10   some or all the data from the template 222. Alternatively, the computer games 132 may

11   include data derived from or based on data from the template 222. The geographic data

12   in the computer game 132 eventually produced by the computer game developer 130 may

13   be in a different format than the data contained in the template 222.

14   Referring to Figure 4, the computer game developer 130 may use a geographic

15   data API (application programming interface) 140 and geographic data tools 144 to

16   access and use data contained in the template 222. In one embodiment, the API 140 and

17   data tools 144 are similar or identical to the interface layer and related navigation

18   applications described in U.S. Pat. Nos. 5,974,419, 5,953,722, 5,968,109 and 6,047,280,

19   the entire disclosures of which are incorporated by reference herein. In general, the

20   geographic data API 140 provides a library of functions that facilitate accessing the data

21   contained in the template 222.

22   The geographic data API 140 and data tools 144 provide various ways that the

23   data in the template 222 can be accessed. Some of the ways the geographic data API 140

24   and data tools 144 provide for accessing the geographic database 118 are described in the

25   copending application entitled. "METHOD AND SYSTEM FOR USING GEOGRAHIC

26   DATA IN COMPUTER GAME DEVELOPMENT", Attorney Docket No. N0184US, the

27   entire disclosure of which is incorporated by reference herein.

28   Using the geographic data API 140 and data tools, the game developer combines

29   the template 222 with road model data (which adds visual representations of various

30   road-related things, such as lampposts, lane markers, pavement colors, and so on), 3D

1   model data (which add buildings, trees, etc.) and other game related components (such as

2   characters, game logic, vehicles, game rules, and so on). In the computer game product,

3   the template may be integrated into the code base or may exist separately.

4   The computer games 132 created using the data from the template 222 provide for

5   representing geographic features in play scenarios of the computer games. The

6   geographic features depicted by the computer games do not represent actual, real world

7   geographic features, but are similar to the kinds of actual features that a person would

8   find in a typical locale in a given geographic region. These depicted features include a

9   road network, which is similar to the kind of road network a person would find in a

10   typical locale in the given geographic region. This simulated road network in the

11   template can be provided with the same level of accuracy and detail as a real road

12   network.

13   The computer games 132 produced using the geographic template 222 are

14   installed on appropriate computer platforms 134. The computer platforms 134 on which

15   the computer games 132 are installed may include personal computers, game consoles,

16   PDAs, handheld game devices, mobile phones, networked computers, and so on. Users

17   access the computer games 132 on the computer platforms 134 to play the games.

18

19   III.   SECOND EMBODIMENT

20   Figure 5 shows a second embodiment of a system for developing a computer

21   game using a template that contains data that represents a simulation of real world

22   geographic features of the current time or of past or future times. Figure 6 shows a

23   flowchart of a process 308 performed by the system of Figure 5. The process 308 can be

24   performed by the map developer 101 in Figure 5 using the template compiler 304 in

25   Figure 2. The process 308 of Figure 6 is similar to the process 208 of Figure 3, and like

26   steps are indicated by the same numerals.

27   The process of 308 in Figure 6 differs from the process 208 in Figure 3 in that

28   after a basic geographic template is formed using data that represents actual geographic

29   features in actual locales (Step 228 or 232), additional data is added to the basic template

30   by the map developer 101. In this embodiment, the additional data that may be added to

1   the template includes road model data obtained from a road model database 170 and 3D

2   model data obtained from a 3D model database 174. (In the first embodiment described

3   in connection with Figures 3 and 4, road model data and 3D model data are added to a

4   geographic template by the game developer.)

5   The data in the road model database 170 are representations used for visual

6   appearance and rendering of road-related things, such as road pavement, lane stripes,

7   curbs, sidewalks, signs, lampposts, lane dividers, traffic signals, speed bumps,

8   crosswalks, and so on. These road model representations are associated with data

9   representation of the simulated road network formed in the first part of the process 308.

10 As stated above, the data representation of the simulated road network formed in the first

11 part of the process 308 is derived from representations of road networks used for

12 navigation. As such, the data representation of the simulated road network formed in the

13 first part of the process 308 may not indicate what roads, or things associated with a road,

14 look like. For example, the data representation of the simulated road network formed in

15 the first part of the process 308 may indicate the locations (e.g., geographic coordinates)

16 of intersections, and possibly the locations of points along a road segment between

17 intersections, the legal (and illegal) connections between roads, the names of roads, the

18 addresses ranges along roads, the type of road surface, and so on. However, in the data

19 representation of the simulated road network formed in the first part of the process 308

20 may not contain information that indicates the actual visual shapes, colors, dimensions,

21 etc., of these road-related things. For example, the data representation of the simulated

22 road network formed in the first part of the process 308 may not indicate the colors of a

23 road, curbs, sidewalks, what a sign looks like, and so on. The road model database 170

24 includes these types of information.

25   An integration step (Step 364 in Figure 6) provides for associating data in the road

26 model database 170 with data from the representation of the simulated road network

27 formed in the first part of the process 308. The integration step 364 may associate road

28 model data with specific locations along a road segment (as represented in the data

29 representation of the simulated road network formed in the first part of the process 308)

30 or with lengths along such a road segment. As an example, the integration step 364 may

1   provide for showing curbs (using a model for what a curb looks like from the road model

2   database 170) along all side streets (represented by data from the representation of the

3   simulated road network formed in the first part of the process 308). In another example,

4   the integration step 364 may provide for showing barriers along all the sides of

5   expressways (using a model for barriers from the road model database 170) as

6   represented by data from the template. The integration step 364 may also provide for

7   associating data models for traffic signals at simulated intersections represented in the

8   template formed in the first part of the process 308.

9   The data representations of road-related things in the road models database are

10   also used for providing other properties of the represented things, such as the physical

11   and audio properties. For example, causing a simulated vehicle to move over a simulated

12   curb causes the simulated vehicle to "bump." Similarly, a simulated vehicle "hitting" a

13   simulated lamppost causes a simulated crashing sound.

14   The road model database 170 may include a variety of different data models for

15   some types of road-related things. For example, there may be a number of different types

16   of traffic signal configurations. These different types of traffic signal configurations are

17   used to provide variety and to make the representation of the road network appear more

18   realistic, i.e., so that all the traffic signal configurations do not look the same.

19   The map database developer 101 uses the integration step 364 to combine data

20   from the road model database 170 with the representation of the simulated road network

21   formed in the first part of the process 308 to provide a realistic appearing road network.

22   The road model database 170 is not intended to represent the actual road-related things,

23   such as the exact locations of or text on signs, or the exact configuration of traffic signals,

24   etc. Neither the basics template formed in the first part of the process 308 nor the road

25   model database may contain information that represents the actual location of signs or the

26   exact configuration of traffic signals. However, the road model database 170 provides

27   data for visually representing these road-related things in a manner that would be typical

28   for the geographic area. So, for a residential neighborhood, the road model database

29   would include models for sidewalks, cross walks, stop signs, etc., which would be

30   associated with appropriate locations along the representation of the simulated road

1   network formed in the first part of the process 308. The integration step 364 and the road

2   model database 170 provide for both the density (how many signs per mile or how many

3   lampposts per block) and the style (shape, height, sign text wording) of these road related

4   things.

5   As mentioned above, the integration step 364 associates data from the 3D model

6   database 174 with the representation of the simulated road network formed in the first

7   part of the process 308. The 3D model data in the 3D model database 174 includes

8   representations used for visual appearance and rendering of cityscape- and landscape-

9   related things, such as buildings fences, trees, shrubbery, lawns, fences, clouds, scenery,

10   and so on. The 3D model database may also include information such as POI types,

11   business/residential zones, socio-economic information, etc. Like the road models, these

12   3D model representations are associated with locations along the simulated road network

13   data representation contained in the template formed in the first part of the process 308.

14   The data representations of cityscape and landscape-related things in the 3D

15   models database are also used for providing the other properties (e.g., physical and audio)

16   of the represented things. For example, causing a simulated vehicle to strike a simulated

17   building causes the simulated vehicle to stop and make a crashing sound. As another

18   example, a simulated vehicle can drive over a simulated shrub, but not a simulated tree.

19   After the geographic database developer 101 has integrated the data

20   representation of the simulated road network formed in the first part of the process 308

21   with the data from the road model database 170 and 3D model database 174, as

22   appropriate, an enhanced template data product 300 is produced. This enhanced template

23   300 is provided to the game developer 130.

24   Referring to Figure 7, the game developer 130 uses the enhanced template 300 to

25   produce computer games. The game developer 130 combines the enhanced template 300

26   with other game-related components and inputs 190. Among the other game-related

27   components and inputs 190 are data and programs that provide and/or represent

28   characters, game logic, vehicles (both for the first person game player as well as others),

29   and game rules. The other game-related components and inputs 190 also include

30   programs for rendering and graphics. The other game-related components and inputs 190

1   may also include components (e.g., applications, programs, etc.) that make specific use of

2   the geographic data, such as a route calculation application that determines a route that

3   can be used as part of the play scenario of the game. The development of some computer

4   games may include additional components and/or inputs whereas other computer games

5   may require fewer. Creation and development of these game-related components and

6   inputs are known to those of skill in the art. The game developer 130 combines enhanced

7   template 300 with the other game-related components and inputs 190 using a suitable

8   linker and/or compiler 194. The computer game 134 produced by the computer game

9   developer 130 is distributed (and/or sold or licensed) to end users using any suitable

10   distribution channels.

11

12   IV.   THIRD EMBODIMENT

13   Figure 8 shows another embodiment of a system for developing computer games

14   using templates that contains data that represents simulations of real world geographic

15   features of the current time or of past or future times. The system of Figure 8 is similar to

16   the system of Figure 2 or the system of Figure 5, and like components are indicated by

17   the same numerals. The system in Figure 8 differs from the other systems in that

18   geographic templates are provided to the end users. The geographic templates that are

19   provided to the end users may be the same as, or similar to, the geographic templates

20   described above in the other embodiments. The geographic templates may be provided to

21   the end users directly from the map developer or alternatively the geographic templates

22   may be provided to the end users from the game developer. The end users use the

23   geographic templates to help create their own geographic databases for use in their own

24   computer games. According to this embodiment, end users could create their own data

25   models of buildings, scenery, characters, vehicles, etc., based on real world or imaginary

26   places, and combine these data models with templates of their own choosing. The end

27   users may create their own data models or may insert other data from other sources, such

28   as freeware, custom design studios, third parties, etc. The process by which end users

29   combine their data models with geographic templates would be similar to those processes

30   described above by which data models are combined with geographic templates by the

1 map developer or the game developer. Suitable applications and programming tools

2 would be made available to end users for this purpose. In one embodiment, an

3 application programming interface (API) would be used in an end user's computer game

4 to access a geographic template which had been provided to the end user. An application

5 programming interface suitable for this purpose is described in the copending patent

6 application entitled "APPLICATION PROGRAMMING INTERFACE FOR

7 GEOGRAPHIC DATA IN COMPUTER GAMES", Attorney Docket No. N0185US, the

8 entire disclosure of which is incorporated by reference herein. End users would be able

9 to use the geographic templates, with their added data models, in their computer games,

10 as described above.

11

12 V.   ALTERNATIVES

13   In the embodiments disclosed above, it was described how template geographic

14 databases could be developed so that the imaginary places represented by the template

15 geographic databases resembled or possessed the style of types of actual, real world

16 places, such as southern Californian city. In alternative embodiments, template

17 geographic databases can be developed that represent other types of imaginary places,

18 such as fantasy places or historical (past or future) actual places. For example, using an

19 embodiment disclosed herein, a template geographic database can be developed that

20 represents New York City in the 1930's.

21   The embodiments disclosed herein describe use of geographic data in computer

22 games. The embodiments disclosed herein can be adapted for using geographic data for

23 other non-navigation-related purposes. Among these other, non-navigation purposes are

24 simulations and movie making. For example, the embodiments disclosed herein can be

25 adapted for using geographic data for simulation systems. Simulation systems that can

26 use geographic data include systems that simulate emergency operations (such as

27 evacuation procedures or emergency vehicle deployment and routing), driver education

28 systems, etc. When using any of the disclosed embodiments for movie making, a

29 relatively high visual accuracy may be required and therefore attributes that provide for

1   relatively high visual accuracy may be needed. However, fewer attributes of some types

2   may not be required.

3   The embodiments disclosed herein can also be used in movie making. Many

4   movies use computer-generated images of real (or imaginary) locations, instead of actual

5   images. The embodiments disclosed herein can be adapted for creating realistic-looking

6   geographic locations, including features such as road networks, for use in movie making.

7   The embodiments disclosed herein can be used on various different types of

8   computer platforms, including client-server platforms and peer-to-peer platforms. The

9   embodiments disclosed herein can be used with streaming or other technologies.

10   The embodiments disclosed herein may also be used for games that use

11   geographic data obtained from multiple sources, e.g., more than one source geographic

12   database. In these embodiments, the data from the multiple source geographic databases

13   may be combined by the game developer or by another party.

14   In the embodiments disclosed above, it was described how a template that

15   represents an imaginary locale for use in computer games could be derived from data that

16   represents actual geographic places and which is used for other non-game-related

17   functions. In an alternative embodiment, a template for use in computer games may be

18   derived from data collected specifically for the purpose of use in computer games.

19   According to this embodiment, the template could represent an actual or an imaginary

20   locale and would be sold or licensed to game developers for use in computer games.

21

22   VI.   ADVANTAGES

23   The disclosed embodiments solve a problem facing the computer game industry,

24   namely the need to expend significant resources to gather geographic information for use

25   in individual game titles.

26   As mentioned above, the templates provided by the disclosed embodiments may

27   include more than road network data and may include such items as 3D building views,

28   POI types, business/residential zones, socio-economic information, etc.

29   The template disclosed herein is a new product. The template may be used to

30   provide what a typical European or Mid-West United States city looks like. The template

1 would depict the typical POI placement in relation to other POIs and residential

2 buildings, how its streets regulate traffic, and how newer cities tend to be designed

3 differently than older cities, etc.

4

5 VII. <u>EXAMPLES</u>

6 The following are examples of different types of computer games and/or

7 applications that can be developed using the disclosed embodiments. (Note that some of

8 the games are new and some are updates and/or improvements of prior games.)

9

10 A. <u>City development simulation game</u>

11 Geographic data that represents actual, real-world locales can be used in a type of

12 computer game in which players simulate growth of an urban (or other regional)

13 environment. In this kind of game, players simulate building cities or other places (such

14 as towns, countries, rural areas) by designing roads, utilities (e.g., electrical, sewage,

15 water) and other infrastructure elements for a geographic area. Then, the computer game

16 allows a virtual city to develop based on the designs. The virtual cities can be detailed

17 including individual zoning requirements (e.g., residential, commercial, industrial, etc.),

18 crime layers (i.e., that can be changed by implementing police stations), traffic,

19 unemployment and other realistic features.

20 Geographic data that represents actual, real-world locales can be used in this type

21 of game to provide a high level of realism thereby allowing game players to build cities

22 based on real world city models. In this type of game, players may choose a specific city

23 model (e.g., Paris), and attempt to improve or replicate it. The inclusion of real time

24 traffic, weather, points of interest (periodically updated or real time) and other real world

25 content would serve to increase the realism of such a virtual city. This improvement

26 could add realism, player loyalty, recognition, and an alternative goal to this popular type

27 of game.

28

1 B. Virtual person development simulation game

2 Geographic data that represents actual, real-world locales can be used in a type of

3 computer game in which game players simulate development of a virtual person (e.g., a

4 "sim"). In this kind of computer game, players build a virtual person by managing that

5 virtual person's habits, tendencies, house, family, job and interactions with other virtual

6 people. In prior simulation games of this type, the locales in which virtual people live

7 were non-specific. In prior simulation games of this type, the locales were modeled from

8 the view of the player's virtual house and may have included some features specific to

9 the game manufacturer.

10 Data from a source of geographic data that represents actual, real-world locales

11 can be used in this type of game to provide a high level of realism, thereby allowing

12 players to build virtual characters in models of real cities, with models of actual real-

13 world points of interest, streets, landmarks and neighborhoods. When starting this type

14 of game, which has been enhanced by the addition of geographic data that represents

15 actual, real-world locales, a player chooses a real world city. Once the city has been

16 chosen, neighborhoods from the city become available for the player to select (e.g.,

17 Chicago's Gold Cost, Lincoln Park, Rogers Park, River North, or specific suburbs).

18 Once the player selects a neighborhood, the player's virtual person would be able to

19 simulate visits to virtual attractions based on real world local attractions, e.g., go to

20 popular restaurants and bars, work in local businesses, and reflect how life is lived in that

21 specific area almost as if he/she were living there.

22

23 C. "Bot-fighter" game

24 Geographic data that represents actual, real-world locales can be used as a

25 backbone for a "bot-fighter"-type game. This enhances the bot-fighter-type game by

26 incorporating detailed spatial data that represents real world locales. A "bot-fighter"-type

27 game can be played on mobile phones. In this game, players build "warrior robots" on

28 their mobile phones using credits (e.g., virtual money) from battles won against other

29 players. All firing between warriors is done via SMS messaging over the mobile phones.

30 With mobile phone technology, a player may be given rough coordinates to his or her

1 player-enemies or be warned when a player-enemy has entered his/her area or turf via

2 mobile phone positioning technology.

3 The addition of geographic data that represents actual, real-world locales can give

4 this type of game greater appeal. Specific route data and location details or spotting

5 could be provided instead of simple proximity alerts. The addition of geographic data

6 that represents actual, real-world locales would enable this type of game to support more

7 precise boundaries. Further, with the addition of geographic data that represents actual,

8 real-world locales, a game player's weapons could be given more accurate range

9 limitations, rather than rough limitations available with existing games.

10 In addition, game credits (e.g., virtual money) could be spent on routes, enemy

11 interception (based on known movements or historical patterns) courses, or enemy

12 spotting locations.

13

14 D. Traffic management game/application

15 In this computer game/application, data that represents the road network in the

16 real world is used in combination with traffic feeds and models in order to simulate a real

17 city with its existing traffic patterns. Once a model of an actual city with its road network

18 and traffic patterns is created, predictive modeling and comparisons to other cities allow

19 the user to tweak, re-model, or re-design traffic architecture to improve the road network

20 with the objective to create the most efficient traffic system or to make the most

21 improvements to an existing system.

22 This computer game/application can include a vehicle fleet management feature.

23 According to this feature, the game player is given a virtual fleet of vehicles (e.g., starting

24 with two trucks) in an initially chosen city and an overlay of existing traffic conditions.

25 The goal of the game with the fleet management feature would be to provide service to a

26 customer base (i.e., based on real world businesses represented in the real world

27 geographic database and some zoning data). Time of day for delivery, fleet routing, fuel

28 expenditures, pickup points and schedules etc., would all be managed by the game player.

29 Traffic flow, incidents, bottlenecks and other traffic data would be displayed.

30 Wired or live devices would also have the ability to add live or updated data. Traffic

1   would be made up from individual vehicles, following typical vehicle movement patterns

2   (e.g., gapers, cars driving down the shoulder, etc.) or could be built from scratch.

3

4   E.   Emergency services and law enforcement games

5   Geographic data that represents actual, real-world locales can be used in

6   emergency services scenario-type games or law enforcement scenario-type games. These

7   games include themes related to fire fighting, medical emergency services (e.g.,

8   ambulance, search and rescue), police chases, etc. Game developers who make these

9   kinds of games can use the disclosed embodiments to provide realistic looking locales,

10 possibly with the addition of location-based content (e.g., actual buildings, businesses

11 etc.), traffic, weather, points of interest, etc., as part of the playing scenarios of these

12 games.

13

14 F.   Location quiz game

15   Geographic data that represents actual, real-world locales can be used in a

16 location quiz-type of computer game. In this type of game, game players are provided

17 with clues about a game character's secret location and attempt to determine the secret

18 geographic location. Using geographic data that represents actual, real-world locales

19 adds a measure of realism to this type of game and increases its educational value.

20   One feature of this game is the ability to personalize the game to a player's locale.

21 Players would be able to search for the secret location in their own city or neighborhood.

22 For example, parents could use the game to teach their children how to get around in their

23 own neighborhoods. According to this example, parents could set up the game to include

24 the route that their child takes to and from school. Also, if a family moves to a new

25 neighborhood, the parents could obtain up-to-date digital map data that represents the

26 new neighborhood in order to teach their children about the new neighborhood.

27   Adding digital map data to the game would also provide the capability to play it

28 anywhere the player is located. For example, a child from Chicago who is on vacation in

29 Paris could search for the game character in Paris and thereby learn about the city.

30

1   G.   Children's atlas

2   Another computer game/application that can use geographic data that represents

3 actual, real-world locales is a children's atlas game/application. This computer

4 game/application can be used by families on long car trips. In one embodiment, this

5 game/application could be used to answer children's questions such as "Are we there

6 yet?" or "Where are we?" with distances and times to destinations.

7   One version of this game includes a communications feature that allows a child to

8 communicate with other children who have games with the same feature. Another

9 version of this game/application allows a game player to create a virtual travelogue that

10 describes and records travels in real time.

11   In one embodiment, a children's atlas game/application would be developed as a

12 travel companion game that obtains location information from an in-vehicle navigation

13 system or remote server. As a car in which the child is a passenger drives through a

14 specific locale (e.g., a town or attraction) or a more general area (e.g., a state), the

15 children's atlas application would display images and use voice narration to provide facts

16 about the area. The children's atlas game/application would also provide well-known

17 stories or legends about an area (e.g., Johnny Appleseed as the child is traveling through

18 the Appalachians).

19   In another alternative embodiment, the children's atlas includes a travel pal

20 feature. This feature allows a child traveling through an area to connect online with other

21 children who located in the area. In one version of this feature, children can

22 communicate with other traveling children or with other children located in the area a

23 child is passing through using instant messaging. A buddy list may be formed and used

24 for this purpose. Children could access this service while traveling or at home. For

25 example, children could exchange information about their travels or play games.

26 Children passing through a particular place could instant message with children living in

27 the area and ask questions about the area, e.g., what do the locals think about the best

28 places to eat, what is the best radio station, etc.

29   According to another alternative embodiment, the children's atlas application

30 includes a virtual travelogue feature. The virtual travelogue feature allows a child to

1   collect, store, and send information about his or her travels as a trip is taking place. The

2   child could take information provided by the atlas game/application, annotate it with

3   personal experiences and observations, and send it to friends and relatives, or to a home

4   website that eventually turns into a scrapbook of the entire trip (or perhaps a report on a

5   school field trip), complete with maps, pictures and postcards from the area, voice

6   narration, and any other data collected along the way.

7   The virtual travelogue feature could also catalogue and automatically store every

8   place the child has traveled. The child could then display or print out a map that shows all

9   the places he or she has been and how he or she got there.

10

11   H.   Simulated tour

12   Another application that can use geographic data that represents actual, real-world

13   locales is a simulated tour application. This simulated tour application uses geographic

14   data, POI data, 3D modeling, and other data, such as weather, traffic, crime statistics, and

15   restaurant guides, to build a realistic view of a city or other locale for virtual touring. The

16   simulated tour application could be used by people considering moving to a new area, or

17   could be hosted by realtors, or used by travelers, or simply used by individuals to learn

18   more about different locations.

19   With this application, one can learn, understand, explore, or market a specific

20   area. This application would portray an area visually, textually, and possibly even

21   audibly. Smells (e.g., heavy fog, chocolate factory nearby – pervasive) could be provided

22   using appropriate technology or described textually.

23   One use for this application is to provide a way for a person to become familiar

24   with driving in an unfamiliar city. Some cities may have driving conventions that are

25   unfamiliar to some people. For example, speed limits are painted on the road in

26   California and Hawaii whereas they are located on little signs in Illinois. According to

27   another example, traffic is particularly aggressive in Rome and lanes are viewed as

28   guidelines, not rules etc.

29

1   I.   Car rally challenge game

2   Another computer game that can be improved using geographic data that

3   represents real world places is a car rally challenge-type game. This game can be played

4   in single player or multi-player versions. In this type of game, teams of game players

5   travel actual routes that are sent to them from a central server. The server would store a

6   number of car rally routes and attribute scenarios (e.g., points of interest as checkpoints)

7   for a specific area (e.g., state, city, neighborhood, etc.), and these virtual rally instructions

8   would be sent to the participating drivers and navigators.

9   An organizer's kit could also be offered that would cater to amateur car rally

10   organizations or clubs. The kit would allow an individual or organization to create a

11   customized car rally specific to a city or area. The rally information could be created on

12   the rally organizer's personal computer within a program, or via download from a

13   website. It could then be printed out and handed to the racers or downloaded to a device

14   such as a PDA.

15   The difference between the game and the kit is that the game would send out pre-

16   determined routes and rally features. The routes and features might change regularly but

17   the players would not have a hand in planning or creating the rally scenarios.

18   The kit would provide the basic tools and content to create a rally, thereby allowing the

19   user to add local flavor, degrees of difficulty, or to even recreate a well-known rally

20   course.

21

22   J.   Location-based virtual monopoly game

23   Geographic data that represents real world places can be used in a computer game

24   based on the Monopoly board game. In one version of this game scenario, a game

25   player's positions and movements in the real world are tracked, using positioning

26   equipment such as GPS, cell phone triangulation, etc. These movements would be used

27   to define game routes for that player. Then, the routes would be used to identify

28   properties (e.g., actual or fictional) along that route the game player could virtually

29   purchase, rent, etc., as in the classic board game. Real world conditions, such as traffic

30   restrictions, road construction, tolls, etc., would be factored into the game play scenario.

K.   Promotional games and contests

Geographic data that represents real world places can be used for promotional concepts (e.g., contests, sales events, and so on). Businesses, such as retailers or restaurant franchises, frequently use special promotions or contests to attract business. Adding location-based data and services to these promotions would allow businesses to better target, reach, and track potential customers, and also add an extra dimension. Promotional tie-ins to location-based data could be developed using a variety of approaches.

L.   Spatial simulator for exercise

Data that represents actual, real world places can be used with sports or exercise-related events or equipment. For example, geographic data can be used to enhance simulators (e.g., monitors) used on or with exercise equipment. Geographic data that represents real places can be used with a treadmill or exercise bicycle to simulate the experience of running or biking along a route. The route would be projected on a monitor or screen in front of the person on an exercise machine such as a treadmill or exercise bicycle.

Use of data that represents actual, real world places could allow users to feel as if they were running through the streets of a major city, e.g., along a marathon or 10K route, or biking the route of the Tour de France. The simulator could also be used to keep track of long-term training goals, such as running virtually across the entire United States.

A basic simulation would consist of a display of a basic overview map based on a route. For example, the user would ask for a route within a city and a basic map would be displayed showing the streets of the city with a mark on the map indicating the virtual position of the runner or bicyclist. The runner's progress along the route would be based on the runner's pace. The degree or category of simulation offered could vary depending on the level of realism desired. For example, details such as road elevation could be

1 added to the simulation. This would allow the person exercising to experience the feeling

2 of running or biking in the Rocky Mountains or through the plains of Nebraska.

3   A detailed simulation would use 3D data and give a full picture on a monitor of

4 the buildings and landmarks along the route. This would give the runner or bicyclist a

5 realistic feeling of running or biking along the route.

6

7   M.   Classic computer games

8   Geographic data that represents actual, real-world locales can be advantageously

9 used to make new versions of classic computer games like Snake and Pacman. In these

10 new versions of these games, game players assume the identities of characters in the

11 game. A player uses positioning equipment that determines the player's actual physical

12 positioning the real world. The player also has equipment that provides for wireless

13 communication with a central database. This player becomes a virtual player in a classic

14 game such as PacMan or Snake. The games would be played in either an online

15 competitive mode or a single player (player versus machine) mode. In either case, the

16 player acts as a character in the game. The distance and speed moved by the player would

17 be translated to movement and speed in a virtual world, where the player may accomplish

18 goals within the game or defeat other players. The system would be set up in translated

19 "virtual boards" where a game would consist of an area regulated by the speed of

20 transportation (a "board" for a vehicle can be significantly larger than one for a

21 pedestrian).

22

23   N.   Location based cannonball run car racing game

24   Another computer game that can use embodiments of the disclosed system and

25 method for providing geographic data is a "cannonball run" car racing game. This game

26 may be played in multi-player or single player mode. The multi-player mode game may

27 be played online. In the game playing scenario, players compete against each other to

28 race vehicles (e.g., cars, bikes, etc.) across a geographical area. Data that represent

29 actual, real-world places would be used to add realism to the game, e.g., actual legal and

1   physical restrictions. Alternative features include the addition of real-time traffic and

2   weather conditions.

3   One scenario for a multi-player online version of the game would feature a

4   community where players start out with a specific mode of transportation. This version

5   of the game would provide an online culture and goal of being with the best group and

6   driving the best vehicle. Players would start with a certain amount of virtual cash and a

7   basic vehicle. Some races would be pre-defined events, whereas other races would be

8   random city races with a user defined start and end points. The selection of routes for

9   races would be based on real map data. The game would be based on winning virtual

10 money by winning races, but winning a race could cost the player due to traffic tickets,

11 illegal traffic maneuvers or other expenses. All fines would be based on legal restriction

12 data and statistics of the percentage of drivers caught. Suggested routes would be

13 provided in all races, and the amount of virtual cash used to buy a route would vary the

14 quality or speed of the route.

15   Game players would have the option of racing through their hometowns, or

16 through the streets of their favorite cities or countries all over the world. These would

17 attract a larger demographic, and interest the casual game player as well.

18

19   O.   Virtual trip planner and simulation

20   Data that represents actual, real world places can be used for a computer

21 simulation application that would allow a user to preview a trip or specific route by

22 virtually driving it on his or her personal computer or game console. The simulation

23 would be based on a representation of the geographic database that included 3D

24 renderings of buildings, signs, topographical features, and other related attributes. The

25 simulation software could be provided on media, through an online vendor, or rented to

26 users on an as-needed basis. Users would enter a route request via their personal

27 computers or consoles and could use gaming steering wheels, joysticks, voice commands,

28 or keyboards to drive the routes. A fast forward function could be used to skip the

29 obvious or mundane sections of the trip or to speed up the pace.

1   To make the simulation more realistic, traffic features, such as vehicles coming

2   and going on the route, could be included. These could perhaps even be based on actual

3   traffic patterns or real-time traffic for a selected time of day.

4   A feature of this simulation application would be as a form of trip planner. The

5   planner would provide information about an area to which one is traveling, such as local

6   history, area specific trivia games, and point of interest descriptions and

7   recommendations. Users would have the option of using this information while driving

8   the area in advance (e.g., using the simulation application, described above), printing out

9   the planner in advance as a reference, or loading it onto a device and accessing it during

10   an actual trip (e.g., going on a long trip and using the planner interactively to keep

11   children amused and informed). For example, if a family was traveling on vacation from

12   Chicago to Miami by car, the parents could research and preview the attractions, hotels,

13   and restaurants at which the family may want to stop along the way. They could also

14   preview the route and create their own form of trip ticket to plan the best route. The

15   parents could then set up an itinerary that would include games, information, quizzes etc.,

16   that would occupy the children throughout the trip.

17

18   It is intended that the foregoing detailed description be regarded as illustrative

19   rather than limiting and that it is understood that the following claims including all

20   equivalents are intended to define the scope of the invention.

21

22